

REPORT OF THE CONSULTATIVE COMMITTEE OF EXPERTS

TO DETERMINE ALTERNATIVE STRATEGIES UNDER

NATIONAL MALARIA ERADICATION PROGRAMME

NEW DELHI

17 – 20 AUGUST 1974

FOREWARD

It is with the deepest sorrow that the committee is submitting this report without the signature of the Chairman, Dr. B.A.Rao, who passed away on the night of the 25-25 August, 1974, at Ahmedabad, before initialing the final report. When he had turned over the first draft to the undersigned soon after the meeting on 20th August, 1974, he had generally discussed the highlights of this report and had forwarded to the Director, National Malaria Eradication Programme. The report is practically the same as Dr. B. A. Rao had left, with minor editorial and the part “Summary”, which has been added.

It was an irony of fate that the first Director, National Malaria Eradication Programme, who launched the programme in 1958 with great enthusiasm and purposefulness should have as the last official act of his life, that too after several years of retirement and detachment, participate in a meeting which virtually converted the programme of malaria eradication to one of containment of the disease under compelling financial constraints. Even in this last act, he exhibited much practical wisdom, which was a characteristic feature of his, throughout life.

Area : 29th August 1974

Sd/ -
(T.RAMACHANDRA RAO)
Vice-Chairman,
Consultative Committee of Experts
On Revised Strategy
For NMEP

**Report of the Consultative Committee of Experts
To determine alternative strategies under
N.M.E.P.**

New Delhi
August, 17 – 20, 1974.

INTRODUCTION

Part I	Preface, Constitution of the Committee, Terms of references, Inauguration, Functioning of the Committee and Acknowledgement.
Part II	Background
Part III	Current and proposed concepts
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P A R T – 1

1. Preface

- 1.1. During the First Five Year Plan, with the assistance of international agencies, and on the basis of the experience gained in the Pilot Projects carried out in various parts of the country National Malaria Control Programme was launched in different States using the residual insecticide (DDT), The result achieved during the conduct of the control programme were spectacular and the Government of India embarked on National Malaria Eradication Programme from 1958 onwards.
- 1.2 Malaria Eradication Programme has been a time scheduled programme which normally would have been concluded by 1968 – 69. The programme instead has suffered setbacks from 1965 onwards resulting in reversions and prolongation of the programme, the current situation being that the incidence has increased from year to year.
- 1.3 Besides, the programme by 1973 has cost the country Rs.256.15 crores. While the increased incidence has required intensive efforts of control involving extension of spray operations in extended areas resulting in the increased cost, the programme presently is faced with the financial constraints and also the shortage of insecticides.
- 1.4 As a routine, the in-de-pendent appraisal teams nearly every year have evaluated the programme in order to make recommendations regarding entry of areas from attack to consolidation to Maintenance. Besides, the Govt. of India committee to study and report the specific aspects, such as Hinman Committees (1960), Chadha Committee (1963), Madhok Committee (1970), the international in-depth Evaluation Team (1970) and more recently the Committee set up to study, in-depth all relevant aspects of N.M.E.P.(1974) (Second In-depth). The recommendations of the above committee except the most recent one, were accepted in principle by the Gov. of India for implementation by the Centre/States. The report of Second in-depth however is under the consideration of the Govt. of India.
- 1.5 Set-backs to the programme during Fourth Plan coupled with acute shortage of insecticide, price hike in the petroleum based products and financial constraints, the provision of Rs.18 crores as against Rs.37 crores required, have necessitated consideration of alternative strategy.
- 1.6 The Govt. of India in collaboration with the W.H.O. set up Consultative committee to consider and advice on the Alternative Strategy for N.M.E.P. and Research Needs in the Field of Malaria.

2. Constitution of the Committee.

- 2.1 The Government of India, Ministry of Health & Family Planning (Department of Health) in their letter No.T,14011/11/74-C\$CD dated 6.7.1974 to the Regional Director, WHO, SEARO, New Delhi and subsequent letters issued in August 1974 to the different States concerned and other agencies decided to constitute the committee of Experts to determine the alternative strategy to be adopted under NMEP as well as to draw guide-lines for research on malaria.

Based on the above, the Government of India further decided that the meeting of the Experts be held in the National Institute of Communicable Diseases, Delhi from 17th to 20th August, 1974.

3. Terms of References

The terms of references were as follows :-

- (i) To assess the present malaria situation in the country.
- (ii) To recommend broad outlines of a suitable strategy for anti malaria operation during 1974-79 in the context of existing constraints.
- (iii) To make recommendation in regard to research needs in the field of malaria.

Inauguration of the Committee and Messages

In the welcome address, Dr. M.I.D. Sharma, Director, National Institute of Communicable Diseases, Delhi welcomed the participants and highlighted the importance of the consultative Committee Meeting.

Thereafter, the message from Dr. Karan Singh, Union Minister of Health & Family Planning and from the Regional Director, World Health Organisation, SEARO, New Delhi were read. The message are given in Appendix I and II respectively.

4. In this inaugural address, Prof. A.K. Kisku, Union Deputy Minister of Health brought out the necessity of calling the Consultative meeting for laying down guidelines for an alternative strategy for adoption in the National Malaria Eradication Programme. He thanked the World Health Organisation for acceding to the request of the Government of India in sponsoring the meeting and highlighted the exception of the country's need from the expert group of Scientists in regard to the alternative strategy. A copy of the inaugural address is given in Appendix III.

Dr.S.Pattanayak, Director, NMEP proposed the vote of thanks.

5. **Functioning of the Committee.**

The Committee unanimously elected the following office-bearers.

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|----|--------------------|-----------------|
| 1. | Dr. B.A. Rao | Chairman |
| 2. | Dr.T.R. Rao | Vice- Chairman. |
| 3. | Dr.B.K. Valid | |
| 4. | Dr.P.N Sehgal | Rapportours. |
| 5. | Shri K.G. Sanmotra | |

Dr. J.B. Srivastava, Director General of Health Services attended the meeting as Advisor.

A list of members and others who participated is given in Appendix V.

After a brief discussion, wherein the various implications of the agenda items were elucidated, the provisional agenda was adopted. The copy of the agenda is given in Appendix IV.

6. Acknowledgements

The Consultative Committee is greatly indebted to Dr. J.B. Srivastava, Director General of Health Services, Government of India for kindly making it convenient to be present throughout in the sessions and providing valuable advice and suggestions in framing the guidelines for evolving the strategy for immediate implementation and for expansion as and when the fund are made available. His guidance in evolving policy in regard to the research for both short term and long term purpose were invaluable. The committee gratefully acknowledges the assistance of the W.H.O. in the making the present meeting of the committee possible at a short notice and for making possible the participation of Dr, G. Gramiccia whose experience in fields of Control/Eradication of malaria and research were very valuable.

The Committee is indebted to Dr. V.S. Orlov, Dr.H.O.Darwish and Dr.R.Baidya of W.H.O.,SEARO for providing information material and for assisting in its deliberations.

The Committee is grateful to the Director, Officers and staff of the NMEP and NICD Directorate for working ceaselessly in providing the necessary data and other facilities for secretarial work.

PART - II BACKGROUND

The Consultative Committee was provided information in regard to the current situation on various aspects of the National Malaria Eradication Programme's progress or otherwise, the problems and the current and the future requirements of the programme. These were then discussed in details, information needing elucidation were provided for forming background material for the evolving of the strategy. Pertinent aspects of the financial constraints, the current difficulty in the procurement of insecticides, the operational and technical problems experience were kept in view for taking them into consideration for evolving the strategy. These are discussed briefly under appropriate headings.

7.1. NMEP-Inception and implementation.

NMEP was launched in 1959. By 1959, all the malaria tracts were brought under insecticide protective coverage as envisaged under attack phase activities of the programme. Case detection procedures introduced during 1960 got stabilized in 1961. During 1963 and 1964, minor focal outbreaks occurred in the consolidation phase areas involving a population of two million treated by routine remedial measures. However, large scale outbreaks which could not be liquidated by routine measures were detected during 1965 and 1966 and 12 million and 17 million population respectively were temporarily reverted to attack phase. Focal outbreaks continued to occur in extended areas with consequent rise in incidence of malaria in consolidation and maintenance areas and during 1968, 91 million population were reverted to attack phase from consolidation and maintenance area.

7.2 Incidence.

Incidence of malaria from 1961 onwards phase-wise is given below:-

Year	Attack	Consolidation	Maintenance	Total
1961	49151	—	—	49151
1962	54454	5121	—	59575
1963	73008	14308	—	87306
1964	83664	29232	46	112942
1965	68132	31492	561	100185
1966	59306	85223	3627	148156
1967	121069	144719	12833	278621
1968	235759	22388	16734	274881
1969	299810	28829	20008	348647
1970	599809	50151	44687	694647
1971	1093250	88683	141184	1323118
1972	1048435	131790	182581	1362808
1973	961582	227582	309800	1498461
(prov.)				

The incidence from 1961 to 1965 is indicative of the achievements gained during 1961; while the cases doubled in attack phase, in maintenance phase areas the

cases were more than three times than those cases increased by nearly one half. It is interesting to note however that even during the period of achievements (1961 to 1965) the trend of the incidence in consolidation was to increase. During 1973, out of 1498961 positive cases, 309800 cases were reported from maintenance areas.

During 1974, the trend is for the incidence to continue to rise.

7.3 Urban Malaria

At the initial planning of NMEP no provision was kept for antilarval operations, as initially it was thought that while spraying could be carried out under NMEP in the peripheral areas of the towns, the antilarval operations would be carried out by the local bodies. The local bodies due to paucity of funds and also complacency failed to carry out the antilarval operations. The problem of urban malaria assumed importance since 1965 but it was only in 1971 that the scheme for urban malaria was sanctioned. Again this year only Rs. 30 lakhs are provided.

7.4 Entomological Aspects.

The entomological aspects has been the one that has not received due attention from the very inception of the programme, In spite of the recommendations made by the various Committees and the annual conference of Malariologists even the recent one held at Bangalore in 1972, the entomological staff at the State head – quarters and in the zones had not been provided except in a few states. Where ever the entomological staff was in position. It was imperative that the recommendations of the Bangalore conference in 1972 must be implemented.

It was intimated that out of 143 units, where susceptibility tests were carried out, 105 units were found to have DDT Resistance in A.culicifacies and in 20 there was resistance to DDT as well as HCH. Further the susceptibility tests with Malathion in Gujarat and Maharastra had shown that LC50 of A.culicifacies to Malathion had increased from 0.3 percent to 3.2 percent. Due to refractory behavior, some vectors. Such as A.Philippnens and A.balebacensis, do not come inside the house for feeding and do not rest there. Therefore, residual spray of the houses even of the higher quality had not completely prevented the transmission Regarding A.stephensi the urban vector, resistance to DDT and HC or DDT alone had been recorded in some towns of Andhra Pradesh, Gujarat, TamilNadu and Rajasthan. Since antilarval operations are required to be carried out to control urban malaria, this does not pose any problem if such measures are properly organized.

7.5 Drug Resistance.

The studies carried out in Assam have revealed for the first time in India the resistance of P.falciparum to chloroquine at RI and RII levels (Low to moderate). N Diphu unit of Assam, 2.5 percent of P.falciparum cases were found to be at RI level and 22.5% are at RII level of resistance. In another study carried out in NMEP Unit, Now gong, resistance of P.falciparum to chloroquine at RI level was observe in 24 percent of the cases. Further in the studies carried out it was found that 38 cases had migrated from Assam to other State showing the possibility of spread of resistances strains of P.falcipuram to other part of the country. In the studies carried out in

Shillong, amongst 38 cases, 2 cases were found to be of RI level and 2 cases at RII level of resistance.

Similarly, the studies have also been carried out by the Defense authorities who have also observed cases of resistance of *P.falciparum* to chloroquine.

The studies have highlighted the problem of drug resistance in *P. falciparum* in eastern states. The studies are being done to delimit the problem.

- 7.6 The NMEP has suffered mainly due to non – availability of adequate quantities of insecticides from 1965 onwards, to deal with effectively and promptly with the foci. Poor fleet of transports affecting the mobility, had been another factor highlighted by the various committee that went in-depth into the working of the programme. It has not been possible to build up the buffer stock of insecticides except during 1972, which was one year when it was possible to provide timely and adequate supply of insecticidal protective coverage.

The situation regarding the availability of the insecticides currently required is very dismal. As against the requirement of 18,600 M.tons of DDT, SHCH, only 13,760M.tons are available. The shortfall in regard to Malathion has further aggravated the situation due to non-availability of this insecticides urgently required for use in double resistant areas.

The prospects of availability of insecticides during 1975-76 is further aggravated as M/s, Hindustan Insecticides Ltd., which is a Government of India undertaking has promised to provide only 50% of the production, the other 50% being utilized by the Agricultural Department. According to the indication available, about 4000 M.tons will have to be imported.

Regarding antimalarial drug, the current requirement is as follows:-

4-aminoquinoline tablets	200 million.
8-aminoquinoline tablets	30 million

While the stock of 8-aminoquinoline is adequate to meet the current year's requirement, 4-aminoquinoline is at present in short supply and efforts are being made to procure the required quantities.

It has been proposed to supply 944, vehicles out of which 310 vehicles have already been supplied. Although efforts are being made to supply the balance, there are financial constraints in the procurement of vehicles

- 7.7 Trends in malaria research and availability of know how for possible support to the programme at the current juncture.
- 7.7.1 ULV Technique to control Urban Malaria – WHO/NMEP Pilot Project
The studies on ULV application of Technical Malathion with ground equipment were carried out in Jodhpur (Rajasthan). The area was selected in Soorssagar of Jodhpur (2/3rd sq.kms).

The basic data both entomologically and epidemiologically was collected from July 1973. Thereafter, fortnightly applications were given except during May and October when the applications were missed. The applications were carried out after dusk and at each application about 28 liters of technical Malathion was consumed. From the data available in studies was carried out during, it was found that the density of *A. stephensi* was kept under control though/out the year. However, in regard to *A. culicifacies* after unprecedented rains in August, the density shot up significantly. The density of *Culex P. fatigans* remained under control throughout the period of application. On the basis of the experience of 1973, this year from August onward, the frequency of application has been reduced from 15 days to 10 days in order to control the incidence on account of the vector *A. culicifacies*.

7.7.2 The recent trends in malaria research and suggestions for future were provided. Currently, the researches undertaken by the National Institute of Communicable Diseases were in relation to the use of newer insecticides and the studies in regard to drug resistance. Alternative drug regimes and the combinations of the drugs have been tried and the reports are available in publications issued in the scientific journal. Experience regarding the use of intermittent irrigation for control of mosquito breeding in rice field was mentioned. The source reduction methods, their applicability, the need for the promulgation of the bye-laws were presented and their utility discussed. The biological control agents as for example the use of *coelomomyces* etc. and other pathogenic agents as for stated to be not of any operational value for the mosquitoes. Similarly, while providing the details of the genetic manipulation of vector mosquitoes, it was stated that the current studies were limited only to the research. At present it seems that for some time to come, genetic manipulation might not be available for operational use in mosquito control projects. It was however, pointed out that the need of the hour was integrated control i.e. the use of source reduction, biological control and chemical control for the control of vector of disease not depending upon any single method. It was brought out that for the implementation of this type of control, the co-operation of the engineers, and public at large might be solicited for achieving the desired results. Legislation would be helpful, but then it had its limitations. Health education would probably be an important approach to the problems of vector control particularly in urban areas.

7.7.3. Availability of pesticides and antimalarials for public Health - Possibilities .

The availability of the insecticides and antimalarials is an important aspect on which the strategy has to be based. It has been pointed out that there has been a large scale use of pesticides in agriculture would increase. Based on the total availability of insecticides and pesticides it would be worth considering whether the need of agriculture and public health should be carefully assessed and the available ones allocated equitably use in public health work.

Similarly regarding the Availability of antimalarials, the feasibility of increasing indigenous production of chloroquine and the manufacture by public undertakings or by business houses of primaquine might be considered. It was suggested a team may be constituted with representatives of CDRI, IDPL, NICD and NCL to go into the indigenous production of antimalarials including Pyrethramine.

APPENDIX V

PARTICIPANTS AND OBSERVERS TO THE CONSULTATIVE COMMITTEE FOR FORMATION OF STRATEGY FOR NATIONAL MALARIA ERADICATION PROGRAMME HELD AT THE NATIONAL INSTITUTE OF COMMUNICABLE DISEASES, DELHI 17-20th AUGUST 1974

SI No	Name	Designation
<u>Participants</u>		
1.	Dr. B.A. Rao	Retired Director, N.M.E.P., Delhi
2.	Dr. J.A. Shrivastav	Director-General of Health Services
3.	Dr T. R. Rao	Retired Director, Virus Research Centre, Poona
4.	Dr M.I.D Sharma	Director, N.I.C.D, Delhi
5.	Dr S Pattanayak	Director I/c, N.H.E.P., Delhi
6.	Dr G. Gvamiccia	W.H.O Medical Officer (Training), W.H.O. /H.Q., Geneva
7.	Dr V. S. Orlwv	Acting Senior Regional Malaria Adviser, W.H.O., SEARO, New Delhi
8.	Dr S.N. Mitra	Officer on Special Duty (Medical Code) Health Department, Orissa
9.	Dr B.K Vaid	Joint Director (Malaria), Madhya Pradesh
10.	Dr K.C. Rastogi	Joint Director (Malaria), Uttar Pradesh
11.	Dr M M Gupta	Director, Virus Research Centre, Poona
12.	Dr R.B.Mitra	Deputy Director I/c, Pesticides Programme, National Chemical Laboratories, Poona
13.	Dr N.L. Mohapatra	Professor and Head of the Deptt. Of Microbiology , A.I.I.M.S., New Delhi
14.	Dr N.L.Wattal	Deputy Director (Ent.), N.I.C.D., New Delhi
15.	Dr. Sehgal	Deputy Director (T&R), N.I.C.D), New Delhi
16.		Assistant Director (Asstt.), N.N.E.P, Delhi
17.		Assistant Director (U.M.), N.N.E.P., Delhi
18.		Assistant Director (Ent.), N.N.E.P., Delhi
<u>Observers</u>		
1.		Regional Malariologist, WHO, SEARO , New Delhi
2.		Regional Entomologist, WHO, SEARO, New Delhi
3.	Mr G. Hariharan	Administrative Assistant, WHO, SEARO, New Delhi
4.		Statistical Assistant, WHO , SEARO, New Delhi

The committee however hopes that with better availability of funds and further advances in technology and method of management the objective of eradication will again become a feasible proposition.

PART III CURRENT AND PROPOSED CONCEPTS

8. Evaluation of NMEP by the first In-depth (1970) and Second In-depth Committees (1974)

8.1. The committee took notes of the valuable recommendations which had been made by the In-depth Evaluation Team of 1970 and was informed that the Government had accepted most of the recommendation in principle. However, because of increasing financial stringency the implementation of many of the proposals either had been done only partially or not at all. The emphasis in all the recommendation the 1970 team was on achieving eradication, at least in 91 percent of the country when it was regarded as feasible.

8.2. The second in-depth Evaluation committee of 1974 took cognizance of the situation which had developed since 1970 and after careful consideration of the pros and cons of the major philosophic of malaria control or eradication and their feasibility, made for first time a concrete proposal for the conversion of the eradication programme into the one of effective control. The idea of accepting control programme with lower targets than with eradication had been discussed by several malariologists. Even the World Health Organisation had recommended a more flexible approach to malaria eradication adopted to local situations. The 1974 committee has in the light of the changed concepts made many valuable suggestions in detail for reorganization of the National Malaria Eradication Programme. The present committee broadly concurs with the approach taken by the 1974 committee but in view of the further developments which have taken place since the submission of its report, particularly. Regarding financial constraints, the present committee has considered the matter de novo. This committee endorses the change in the immediate objective to one of effective control from the long term objective of eradication. The committee hopes that with better availability of funds and further advance in technology and method in management the objective of eradication will again become a feasible proposition.

8.3 The implementation of the recommendation made by the 1974 committee, it is understood, will involve a financial expenditure of about Rs. 37 crores annually. That scale of financial assistance not likely to be available in the near future. Therefore, without making specific comments on the details of the proposals made by 1974 committee, the present committee have had to make a re-assessment of the situation, particularly in view of the fact that only about Rs. 18 crore is in terms of its present purchasing value less than the sum which had been needed annually even in the 1953-58 period of the control programme. Persisting with the concept of eradication with this scale of expenditure is totally unrealistic. The committee has, therefore, in making its recommendations in the ensuing section, kept prominently in view the sole objective of providing the maximum benefit from the valuable resource. The committee appreciate the valuable work of the 1974 In-depth committee but feels unable to comment on the recommendation in details for implementation merely because the necessary funds are not available. If further funds become available in future some of the strategies recommended by the 1974 committee may be considered in the light of the conditions which would be existing then.

8.4 The committee, however, reiterates that they have reconsidered the matter and made the recommendations in this report only as an interim arrangement for the practical purposes for the period 1975-79 and with a sincere hope that a more intensified work would be possible in the near future. The committee regrets to not that the country would have to live with a small incidence of malaria and its hopes that the measures to be recommended will ensure containment of the diseases and that effective and corrective steps will be taken to prevent a further deterioration.

8.5 The committee wishes to emphasize the fact that funds are not the only constraints for malaria eradication/control. The malaria eradication/control programme certainly needs funds but also has to ensure, the full utilization of all other services available. In doing, the programme needs full co-operation and coordinated action with health services, transport authorities, and agencies responsible for supplies/import of drugs, insecticides, pumps etc. In addition it needs coordinated action between the programme itself and other special agencies responsible for its viz, the army, railways, rural projects, municipalities and local bodies. Intense health education and steps to obtain a more positive participation the people in the activities of the programme are specially necessary.

8.6 The committee emphasizes the need for a more positive involvement of the health services in the anti-malaria programme in all the role of the preventive and social departments of over 100 medical colleges in the country can play in the anti-malaria programme should be explored.

8.7 The committee is aware of the fact that it has prepared the new plan of action for malaria as a special device. Attention of the committee has been drawn to the gross under utilization of primary health centers and the absence of basic health services in many parts of the country. Attention is in particular drawn to the inadequacy of laboratory facilities at all levels as there has been no prevision for setting up a network of health laboratory services so far. A general improvement in this regard will be most desirable and it is hoped that Government will take action in this regard. Suitable steps to re-examine all its vertical programme of health care and disease control as how best to integrate them in the basic health services with a view to achieve more effective and fuller utilization of funds and the available man power may be taken.

PART IV REVISED STRATEGIES

- 9.1 As already stated the present committee recognizes the financial and proposes the following strategy with a clear understanding that it is a deteriorated situation, and that its application would require increased awareness by all staff concerned at all levels of the need for applying the measures proposed with the highest technical skill and purposefulness. Another important aspect to be kept in mind is that by the very nature of the proposal made, a considerable level of flexibility has to be introduced, in order that the measures proposed can be applied at any time and wherever they are needed without administrative constraints. The epidemiological classification given hereunder also must be subject to continuous review and revision. It should be understood that the levels of criteria now suggested could be modified subject to increased or decreased availability of funds. With increased availability of funds they will permit measures leading to an improvement of the malaria situation. With reduced funds a further deterioration of the situation will have to be accepted.

The above concept which states the goal in relation to the availability of funds is clearly at variance with the principle of malaria eradication. Under the present circumstances the committee is therefore fully aware that what it proposes is suspension of the application of the rigid eradication concept and the adoption of a flexible control programme of varying efficacy, until such time when conditions will permit the resumption of eradication procedure. The objective of maintaining, as far as possible the existing structures of the NMEP and of making use of the structure of the General Health Services is of paramount importance in view of these objectives

9.2 Classification of areas:-

In order to define the principle that should govern the activities to be implemented in relation to the epidemiological situation, the Committee has agreed that the areas of country should be divided according to the following criteria:

- 9.2.1. Areas in which the malaria services are already, or will SOON OF INTEGRATED INTO THE GENERAL HEALTH SERVICES. (This includes most of the areas considered at present in the maintenance or in the consolidation phase with the proviso that (a) in consolidation phase areas, the integration with the General Health services is recommended and (b) in those areas either in maintenance or in consolidation in which the prevailing API is higher than that is given below should be reverted into category 2, or 3 given below)

9.2.1.1 Areas with API < 0.5 per thousand.

- a) As above formerly in hypo-endemic areas.
- b) As above formerly in meso-endemic or hypo endemic areas.

9.2.1.2 Areas with a API between 0.5 thousand and 2.00 per thousand

- a) As above formerly in hypo-endemic areas.
- b) As above formerly in meso or hyper endemic areas.

9.2.2. Areas with a API between 2 and 10 per thousand. Most of these areas are considered at present under attack, however, areas at present under consolidation or maintenance that show this API must be brought under this category.

9.2.3 Areas with API > 10 per thousand (the same criteria applies as for category 9.2.2).

9.3 It is well known that the distribution of malaria is not uniform and that even within a unit, sub-unit or even a sector intensity of transmission and prevalence of malaria vary from place to place. The goal of economy and efficacy in applying the suggested measures for each area is therefore dependent on the capacity of services to delimit, the smallest possible areas that can be administratively recognized. For the present, in view of the type of data available at the headquarters of the NMEP, a classification has been carried out based on the unit. This is only a provisional expediency in order to judge the costs of the proposed. But it is well understood that with a further delimitation of small areas in each category, savings could be effected and the efficiency of the programme enhanced. It is, therefore, accepted that within the shortest possible time and with the assistance of the States and the units, further demarcation of the areas should be carried out. Section wise and village wise surveillance data when available should be examined.

9.4 For each of the areas belonging to the above three categories different situations, will have to be recognized, that will lead to the application of different strategy. These are urban areas, rural areas, where irrigation or to the types of developmental schemes are in progress, area where indigenous infection with *P.falciparum* have been reported and area which are known to be subjected to periodic epidemics. Within these various types, further distinctions should be made between (a) those where the vector is still responsive to the available insecticides (DDT, BHC) (b) those where the vector have recently proved moderately responsive for reasons of tolerance or partial avoidance of contact of the vector with the insecticides, and (c) where the vectors have proved non-responsive on account of double resistance or marked exophily of the vector(s). It is clear that an evaluation of the degree of moderate or non-responsive can only be made after all important operational reasons that might have affected that might have affected the result of spraying have been excluded (such as in appropriate season of spraying, insufficient coverage of surfaces to be sprayed, inadequate quality of work for poor supervision or other reason, had quality of insecticide, poor public relations leading to refusals etc.)

9.5 Special measures will be required in those limited areas where chloroquine resistance of *P.falciparum* has been detected. Also special indication will be given as to the proposed strategy for the malaria control of those organized groups (security forces, Armed forces, railways employees, mass migration of labour, nomads) for which specific protection measures can be enforced.

9.6 In the recommendations for the strategy to be adopted it will be indicated that in some areas, the application of the present surveillance system will either be less frequent or will be brought under the multipurpose worker scheme. For these areas a AP may not always be available to be used as a criterion for determine the activities to be enforced in each area. Wherever a sample survey of a cross section of a population would need to be used in lieu of surveillance, the following corresponding figures could be considered.

API	0.5 per thousand	P.R.	0.025%
API	2.00 per thousand	P.R.	0.1%
API	10 per thousand	P.R.	0.5%

The direct relationship of the API and PR needs to be more thoroughly studied. The above suggestions are only a guidance.

10 Strategy recommended to be adopted in different types of area

10.1 As dealt with in the foregoing section, the broad categories for classification would be areas showing (a) (i) less than 0.5 cases per thousand population and (ii) 0.5 to 2.0 cases per thousand population (b) 2.0 to 10.0 cases per thousand population and (c) more than 10.0 cases per thousand.

The following measures are recommended to be adopted under the revised strategy for the control of malaria.

(a) (1) Areas showing API below 0.5 cases per thousand population
(a) Hypo-endemic areas

In this category, it is likely that some of the areas would be those which were known to be hypo-endemic for malaria prior to N.M.C.P. In such areas the responsibility for maintenance of vigilance of malaria cases will rest with multi-purpose health workers at different echelons. The work involved will include detection and treatment of cases during the monthly visits of such workers in the local ties.

However, provision should be made for carrying out focal sprays as and when required

(b) Meso-hyper-endemic areas:

Vigilance should be carried out as under (a) above. In addition, provision should be made for mobile teams who will undertake intensive vigilance and spray activities as and when required. The staff required for this will be in addition to what is provided under the multipurpose working scheme. The number of such additional staff would be determined by the size of the areas, and also vulnerability and receptivity of the area.

Provision or adequate supply (up to 5 metric tons per unit area per existing pattern) of insecticide should be made available. The spray should be carried out whenever the epidemiological indices point to the build up of an epidemic.

(a) (ii) Areas with API between 0.5 and 2.0 cases

Vigilance should be ensured with the help of multipurpose health workers. Within these areas there are also likely to be included both the above mentioned tow categories of areas i.e. Hypo-endemic area and meso-hyper-endemic area.

For hypo-endemic zone, there will be one mobile team for every 10 PHCs whereas for meso-hyper endemic areas, there will be ne mobile team for every five PHCs

In addition to this, special provision will be made for these areas by keeping in readiness mobile teams with the State headquarters and RCO headquarters for rendering assistance under emergency condition.

Each mobile team will consist of one health inspector and two spray squads with necessary equipment.

(b) Areas with 8.0 to 10.0 cases API

These areas will basically be considered as in the attack phase. The committee felt that in these areas surveillance organization as at present should be continued but a lesser frequency, i.e. at monthly intervals.

Areas which are responsive to the insecticide recommended under the NMEP will receive (two) round of spray in these areas should be concluded within the shortest possible time (approximately 20days). This would ensure simultaneous coverage with insecticide of a unit area in the shortest possible time and at the appropriate time preventing the transmission of malaria in such localities. The equipment and material for carrying out the spray operations should be located at sub-unit/PHC level.

Spraying squads should be provided on the basis of realistic estimates based in the number of houses that can be covered by a squad per day. Regarding the other two categories mentioned in the classification moderate responsive and non responsive to DDT and BHC and also areas where mosquito vectors are exophilous, the following may also be considered.

- i) Use of alternate insecticide. Malaria if it can be made available.
- ii) Recourse to antilarval measures, wherever feasible, which will be based on an approach to source reduction measures, use of biological control agents – larvivorous fish etc., and chemical control.
- iii) Recourse to mass drug therapy. This would particularly be called for in areas of manageable size with high incidence of malaria (API 5 to 10 cases per thousand population).

(c) Areas with API of >10

In such areas the surveillance machinery should continue to be maintained as at present until the basic health services are established. The transformation should take place only after all arrangement are on the ground which may take two years. Spraying on appropriate insecticide at the proper time should be organized.

10.2 Whereas the country would be divided as proposed on the basis of API, there are situations could be classified as under:-

10.2.1. Urban areas: Anti-malaria measures should primarily comprise of intensive antilarval measures supported by drug treatment. Intensive antilarval measures would include high efficiency in source reduction measures and an integrated approach to level control by of larvivorous fish, use of suitable chemical Larvicides, etc. For to use of synthetic larvicides such as abate and pyrethrum, the committee endorsed the views of recommendations made by the committee constitute by the Government of India for recommending alternative

larvicides. However, as and when newer compounds become available in the market, with low mammalian toxicity they could be used in such situations.

It is to be appreciated that by and large in urban areas the success of antimalaria measures would greatly depend on a total mosquito control including the control of the nuisance mosquitoes. The anti-larval measures against the two are largely similar and overlap each other. In this circumstances, it is strongly recommended that in urban areas the approach may be a total mosquito reduction with some additional measures as may be necessary for malaria control.

10.2.2. Areas with *P. falciparum* infection

1) In areas where *P. falciparum* is predominant the existing surveillance machinery should be maintained for prompt detection and treatment including pyrethomine.

2) In areas where *P. falciparum* is resistance to 4-aminoquinolines special measures should be introduced by way of mobile teams to take care of emergency situations for prompt action, special measures to study the extent of the resistance problem are also to be provided. sufficient stocks of quinine pyrethomine should be made available in all PHCs and dispensaries in the areas.

It was also noted that in some of the areas with *P. falciparum* resistance strains the vector was exophilic and there was considerable amount of extra domiciliary transmission of malaria. Therefore, there was an immediate need for undertaking pilot studies for finding out effective vector control measures under these special situations existing in these areas.

10.2.3. Areas under intensive canal irrigation, large engineering projects and other development projects:

It was noted that certain areas in the country there were well-developed irrigation systems. In such areas the mosquitogenic conditions could be brought under control by evolving proper source reductions measures through engineering method. Such methods had been very clearly described and even adopted in the pre-DDT era but have largely gone into dis-use. Since the re-adoption of engineering methods is likely to take some time to get established, use of safe larvicide's could be considered in such areas, for which at this stage pilot studies need to be undertaken indifferent ecological zones. The facilities for instituting these and other antimalarial measures in these areas should be financed through the activity of Irrigation-cum-Agricultural Departments, or the industries wherever established, by the large plantations etc., as was envisaged in the pre-DDT era. The Activities undertaken in these areas should be the responsibility of District Medical Officer of Health under the technical supervision of State Malariologists and public health engineers.

While an irrigation project is being constructed and other projects mentioned above are underway, there is likelihood of labour concentrations in these areas, which need special care. The labour force employed in such activities should be screened initially for malarial parasite and given radical treatment, wherever warranted by the project authorities.

Vigilance activities through periodical surveillance as done nether to fore will continue in such areas by the project authorities under the overall supervision of District health authorities/State Malariologists.

10.2.4. In epidemic areas, entomological surveillance has to be maintained to collect basic data to help in forecasting epidemics. A liaison has to be maintained with the meteorological departments in the area. If an epidemic is threatened, appropriate remedial measures have to be instituted.

11. Costs:

11.1 Within the short space of time available the committee could not estimate with any degree of precision, the total cost entailed by the revised strategy. The exact cost would be known only after the areas of the country were classified into various categories required for the strategy. The committee hoped that the cost would be much less than that required under the recommendations of the 1974 In-depth committee. If funds were still inadequate, flexibility proposed would permit running of expenditure. However the committee cautions that any further dilutions of the measures proposed in the strategy may lead to exacerbation of the malaria situation. There is urgent need to mobilize all resources, public as well as private to combat malaria. The responsibility of local bodies, industries plantations, Railways, Large agricultural enterprises, irrigation projects and other public undertakings etc., To take prompt and effective measures to prevent development of malariagenic conditions within their own sphere of activity, have to be brought home to the

11.2 From the recommendations made in the body of the report if it is found that the funds available is less than the requirement, economics may be made as follows :-

11.2.1. Surveillance

11.2.1. Abolished in area 10 API, replaced by one post-transmission survey in sample population.

11.2.1.2. Reduced to once in three months in areas with API 2 – 10.

11.2.2. Spraying

11.2.2.1. Limited to one round per year prior to peak of transmission in receptive areas with API 0.2 – 10 or >10 on a selected basis.

11.2.2.2. Abolished in areas of confirmed double resistance to BHC-DI with API 0.2 – 10 or >10 (replaced by ensuring wide availability of drugs and where feasible, antilarval operations).

11.2.2.3. Limited to villages of higher endemicity in areas of modern response with API 0.2 to 10 or > 10.

As a consequence of the above economics certain safe guards have to be observed.

11.2.3. Drugs :

In view of the increased need for drugs, to protect the population approximately 3 times the amount of chloroquine, 10 times the amount of pyrethrine and 3 times the amount of primaquine should be obtained.

11.2.4. Insecticides :

In view of the epidemiological danger brought about by this drastic reduction of measure, it is imperative to safeguard against possible deadly outbreak of malaria that all the supplies in drugs and insecticides required for one years operation be made available in advance.

PART VI

Training

The view of the alternative strategy for the malaria control programme to be adopted in the country a massive re-organisation of training of different categories of personnel will have to be made at the national, Regional and state levels. The training programme for various categories of workers are to be included (a) Basic training in malaria control to the staff associated with the programme, medical and health personnel at all levels. (b) Refresher and re-orientation training at all levels currently working in the programme. Under the multipurpose schemes, training is to be multipurpose workers and other health workers at primary Health Center level and district level. Regarding the duties to be performed by them in respect to the National Malaria Control Programme, it is absolutely essential that all medical officers of PHCs receive adequate training in the principles and practice of malaria control, because the success of the new strategy ultimately rests mainly on them. (c) Specialized training in the form of seminars should be conducted for personnel engaged in malaria control, management and investigations in problem areas in the country. (d) Training abroad: It was felt that the key personnel engaged in research and in field and laboratory investigations on management/Planning in malaria in the country, should acquaint themselves with the progress of work on these aspects in other countries. Opportunities for such training abroad should be enlarged. (e) Training in medical college: It was felt that courses followed in the medical college in the country for under graduates should include specific lectures/demonstration sessions and field training on basic aspects of malaria and other communicable diseases and their control.

Authorities late, while in order situation more accurate data are needed. In this context the committee has noted the fact that evaluation and assessment carried out in the past was often late to permission taking immediate measures. It is therefore recommended that concurrent evaluation of the programme is carried at various levels and that these on occasions should be carried out by agencies not directly involved day to day with the programme itself. The setting up of machinery for such concurrent evaluation needs some thought.

3. Integrated approach to elimination of malaria:

At present two main methods, viz. anti adult residual spraying and chemotherapy are being used with some variation depending on the epidemiological situations, for anti malaria work. The committee recommends that the feasibility studies on the use in special areas of integrated approach involving all possible methods including mosquito source reduction measures should be carried out as pilot projects both in rural and urban areas in different epidemiological situations in the country.

4. Monitoring of chloroquine resistance:

Resistance to chloroquine of *P.falciparum* has been found in some parts of the country and there is a possibility of its occurrence in other parts as well. This would pose a serious problem in future. The committee, therefore, recommends that steps should be taken to investigate the resistance of *P.falciparum* to chloroquine immediately to determine its degree and distribution. The utility of alternative drugs, singly or in combination should be explored.

5. Insecticides – Suscentibility status of vectors :

The vector in different parts of the country have shown variable degrees of resistance to the insecticides in use. At places the vector has become resistance to both DDT and BHC. The committee, in this connection noted the every increasing use of various pesticides in agricultural operations, complicating the situation with regard to the resistance of vectors of malaria. The committee therefore recommends that continuous evaluation of the susceptibility status of the vectors of malarian in different parts of the country should be carried out not only to the insecticides which are currently in use but also other insecticides used in agricultural including the cross-resistance patterns.

6. Antimalarial drugs :

The committee noted that there is no single drug which can eliminate all stages of malaria parasites completely. It is therefore essential that field research be carried out for the most effective drug or combination which may help in curing malaria either singly or in combination. In this context the committee also recommends that an assessment of re-assessment be made of the radical cure schedule especially with regards to the dosage, duration and regimens.

7. Evaluation of larvicides and adulticides :

The committee noted that in many situation, like urban areas, irrigated tract and some problem areas, the most effective anti-malaria measures would involve the use of antilarval measure including larvicides. Further, the currently used adulticides may warrant their use necessitating recourse to antilarval operations. Therefore the committee recommends that studies on the evaluation of the currently used and new larvicides and adulticides be undertaken immediately.

8. Behavioral patterns of malaria vectors :

The committee noted that despite of anti malarial operations for over a decade, areas and pockets exist in the country with persist ant malaria transmission special research efforts have to be made to understand the reasons for these situations. This would involve undertaking research programme to understand the behavioral pattern including transmission pattern, the degree of contact with man and the role of secondary vectors. Such information would be useful in devising methods specially suited to the situation. The above list of projects is by no means exhaustive but includes only those which are of urgency.

12.2. Long term research projects :

1. Studies on variable epidemiological situations : The committee noted that India is a country with diverse epidemiological situations. The patterns of endemicity of malaria and its outbreaks either in epidemic or focal forms vary in different part of the country. The available data does not permit a uniform generalized picture, which can enable the authorities to design antimalarial operations without adequate studies in different parts of the country. The committee therefore recommends setting up pilot projects to study epidemiology in depth in various parts of the country in order to collect the basic information. In this connection intensified study on “mosquito population genetics” should be initiated so that the manner in which the populations react to insecticide pressure may be adequately understood. The

committee recognizes that the epidemiological of malaria as understood a decade ago might have undergone changes and might still undergo further change as a result of the vast implementation of developmental programme in agriculture, rural development and industrial enterprises. The impact of these developments have to be studied.

2. Insecticides : The committee noted that there was a great shortage of insecticides in the country and the vectors had developed resistance to currently used and available insecticides. Research development efforts by organization like the CSIR are necessary for manufacturing of the currently used insecticides by cheaper method and for developing new insecticide to meet the situation. The need intensify production of pyrethrum is strongly stressed and cooperation of the ICAR should be sought. The use of synthetic “garlic” a larvicides, developed by the DAE should be thoroughly explored and tested both regarding efficacy and costs.

3. Antimalarial drugs : Several antimalarial drugs are available but some are still to be imported. There is need for research and development for manufacturing some of the well known drugs which are at present imported and for development of new antimalarials. This task may also be assigned to the CSIR and the IDPL.

4. Vector resistance: The nature of resistance in mosquitoes is not fully understood. There is scope for researches on the genetic and other factors responsible for its variation so that in time these factors could be used for inducing effective control of vector mosquitoes.

5. Biological Control of mosquitoes: In addition to the control of mosquitoes by chemicals, various biological methods are also known which could be used in vector control. Genetic manipulation of mosquitoes has also been advocated. Research in these aspects of mosquito control be initiated or intensified.

6. Immunity of Malaria :

- a) The protective immunity in malaria is highly complex. Genetic constitution on specific factors, humoral and cellur factor are involved in it. Research is needed to understand fully the nature of protective immunity in malaria.
- b) New aero logical methods have now become available for large scale surveys for carrying out sero-epidemiology of malaria. There is need for research and development so that these newer techniques are made available to malaria workers in the country.
- c) Immunization against malaria, in view of the development of resistance both of the parasite and vector chemicals, has to be investigated. This will involve large scale production of the effective antigens through culture of malaria parasites and or sporozoites. Research efforts are needed for their successful mass cultivation with a view to prepare a suitable vaccine for malaria. This would be a long term programme involving severe disciplines. In this respect, N.I.C.D., V.R.C., and A.T.I.M.S. may collaborate.

PART VII S U M M A R Y

1. The committee reviewed the current malaria situation in the country and took note of the recommendations made by the previous committee.
2. The committee endorses the immediate switch over of the objectives of the programme to that of an effective control. In doing so it was guided primarily by the financial constraints.
3. A new strategy is suggested based on a realistic appraisal of the position.
 - i. The different parts of the country should be classified according to the existing malaria incidence, previous malaria status, relationship to insecticide resistance and drug resistance, urban or rural situation, etc.
 - ii. For each category a new strategy of action has been proposed.
 - iii. Flexibility of the strategy depending on actual development and scale of availability of funds has been stressed and guidelines indicated.
4. The needs for implements the programme are suggested they include (a) short term studies more in the nature of development research to meet the actual needs during the next 2-3 years and (b) Long term studies which would help in developing programmes for final victory over malaria.
5. Proposals for training personnel at all levels to serve the immediate needs of the programme as well as the development of a band of malariologists have been made.
6. The committee has stressed that the proposal for the new strategy has been forced by circumstances and should be regarded only as an interim measure. The proposals are made only for the purpose of obtaining maximum result with the available funds. While hoping that they would help in containing malaria within the levels which have not been reached, the committee has stated that till conditions improve. The country would have to live with a certain amount of malaria.

For post-graduate levels it was felt curricula should be evolved which would concentrate on job orientation with a view to malaria a trained personnel available for malaria and other public health programme in the country.

(f) Training should be on a long terms basis so as to provide academic qualification that would constitute an incentive for possibilities of carrier development. The committee noted, with distress, that the band of Malariologists who had been the backbone of the antimalaria programme in the country in the past has almost disappeared. Every effort should be made to encourage young and brilliant scientists or medical graduates to take up Malariology as a career both by providing incentives and job opportunities.